MODIS
SCIENCE DATA SUPPORT TEAM
PRESENTATION

January 17, 1992

AGENDA

1. Action Items
2. Science Algorithm Porting
3. Revised MODIS Processing Requirements: AM and PM Orbits
4. FY 1992 Work Plan

ACTION ITEMS:

08/30/91 [Lloyd Carpenter and Team]: Draft a schedule of work for the next 12 months. Include primary events and milestones, documents to be produced, software development, MAS support, etc. (An updated draft version is included in the handout.) STATUS: Open. Due date 09/27/91.

12/06/91 [Liam Gumley]: Investigate a cataloguing scheme for the MAS data. Consider the Master Catalogue, PLDS and PCDS. STATUS: Open. Due date 02/14/92.

12/06/91 [Liam Gumley, Tom Goff, Ed Masuoka]: Develop a plan for storing and distributing MAS data. STATUS: Open. Due date 02/14/92.

01/03/92 [Ed Masuoka]: Check on the UCAR "copyright" as a first step in standardizing an SDST software copyright statement for code sharing. Check with legal. (Legal is developing the statement.) STATUS: Closed. Due date 02/14/92.

01/03/92 [Team]: Get a "long arc" of high-resolution AVHRR data for study of time correlations of pointing errors. STATUS: Open. Due date 02/14/92.

01/03/92 [Team]: Check on the set of software engineering tools available in Code 530 to see if any of these would be of use to the SDST. STATUS: Open. Due date 02/14/92.

Science Algorithm Porting
Thomas E. Goff
16 January, 1992

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* **Anonymous FTP facilities** - The anonymous ftp account on the ltpiris2 computer is in the process of being updated into a group ownership to allow MODIS group users to post files to this area.

* **Science Code Portability** - The source code and data sets for Mike King's cloud top algorithm have been successfully ported to the LTP lptiris2 computer. This represents a change from last week as the cdc910b16 iris did not have sufficient disk space to hold all the data required to execute this program. The program compilation is performed on the cdc910b16 iris due to FORTRAN availability, but must be executed on the ltpiris2 due to disk availability. Here are comments outlining some of the problems that were encountered:

  - The operating system on the IBM 3081 is in the process of being changed. JCL statements that are documented in the available literature are no longer valid for the new operating system and must be updated to the new conventions for the existing code to execute.

  - The FTP access to the mainframe works beautifully and performs record, EBCDIC to ASCII, and directory services as advertised.

  - Phone access is not always available to the main frame and once on the machine only a line editor is available. Telnet access proved more reliable but the IBM telnet server performs screen I/O that is not known to personnel at RDC. Entering illegal commands due to spelling errors gets you into never-never land.

  - The TAG support people dumped the data sets to their terminal and indicated that the data sets were IBM floating point. This precludes the direct importation of this data to any other machine architecture. This left a choice of porting the data origination programs in addition to the algorithm or writing a program on the IBM to convert the real numbers to pseudo integer numbers which can be ftp'd in binary (image) mode to machines that do not swap Bytes. This includes the SGI iris computers. The number can then be swapped back to resident machine floating point for ingestation to the algorithm.

    The driving criteria for all this effort was to port the code while minimizing any code changes to the original code, thereby avoiding the creation of bugs. The above effort would not have to be made if science algorithms that are to be ported use only integer binary data sets. Byte swapping would only be necessary on those few machines (DEC VAX and PC's) that do not follow normal conventions.

  - The IBM subroutines for time determination and unformatted I/O will be written in skeleton form in order to complete this algorithm porting effort.

DISCUSSION ITEMS

* A library of the above mentioned subroutine functions should be generated or otherwise obtained to allow porting of routines among the various machine to be encountered in the MODIS time frame. A search is in progress to find copies if they exist.

* The file dumping utility (FDUMP) and the companion character replacement utility (REPLACE) will be placed on the MODIS anonymous ftp site as soon as some legalities are straightened out! This program would have been of great use on the IBM 3081 and I will endeavor to port it there for future use.

c:\modis\status.wp

Revised
MODIS Processing Requirements:
AM and PM Orbits

Data Rate and Volume Estimates for MODIS-N and two MODIS-Ns

Earth Radius (km)	6371
Satellite Altitude (km)	705
Orbital Period (min)	99
Modis-N # 1000 m REF channels	12
Modis-N # 500 m REF channels	3
Modis-N # 250 m REF channels	2
Modis-N # 1000 m TIR channels	17
Modis-N # 500 m TIR channels	2
MODIS-N # bits/REF channel	12
MODIS-N # bits/TIR channel	12
MODIS-N REF Duty Cycle	50%
MODIS-N TIR Duty Cycle	100%
MODIS-N # Along-track IFOVs	8
MODIS-N # Detectors	648
MODIS-N # Maximum scan angle (deg)	55
MODIS-N # IFOV FWHM (deg)	.0813
MODIS-N # pixels along-scan/on-Earth	1354
MODIS-N Scan Period (sec)	1.5
MODIS-N VIS Data (megabits/scan)	7.3
MODIS-N TIR Data (megabits/scan)	3.2
MODIS-N Daytime Data (megabits/scan)	10.5
MODIS-N # Scans/Orbit	5000
MODIS-N Daytime Data Rate (mbps) (Note 1)	10.4
MODIS-N Nighttime Data Rate (mbps)	2.3
Two MODIS-Ns Daytime Data Rate (mbps)	20.7
Two MODIS-Ns Nighttime Data Rate (mbps)	4.7
MODIS-N Orbital Ave Data Rate (mbps)	6.4
Two MODIS-Ns Orbital Ave Data Rate (mbps)	12.7
MODIS-N Daily Data Volume (gigabytes)	68.6
Two MODIS-Ns Daily Data Volume (gigabytes)	137.2
MODIS-N Volume (gigabytes) Level-1A	72.0
Two MODIS-Ns Volume (gigabytes) Level-1A	144.0
MODIS-N Volume (gigabytes) Level-1B	121.6
Two MODIS-Ns Volume (gigabytes) Level-1B	243.3

Note 1: Data rates are from Hughes System Study Review Package. They include calibration & overhead.

MODIS LONG-TERM ARCHIVE STORAGE REQUIREMENTS (GIGABYTES PER DAY PER MODIS-N)

	PRODUCT LEVEL				
DATA PRODUCT	1A	1B	2	3	TOTAL
Navigation		15.0			15.0
Calibration		5.4			5.4
Spacecraft Ancillary	4.3				4.3
At-Satellite Radiances	67.7	96.0			163.7
Water-Leaving Radiances			4.0	6.6	10.6
Single Scattering Aerosol Radiances			2.6		2.6
Angstrom Exponents			0.4		0.4
Chlorophyll-A Concentrations (Case 1)			0.4	0.2	0.7
Chlorophyll-A Concentrations (Case 2)			0.0	0.2	0.3
Chlorophyll-A Fluorescence			0.4	0.2	0.7
CZCS Pigment Concentrations			0.4	0.2	0.7
Sea-Surface Temperature			1.1	0.2	1.3
Sea-Ice Cover			0.1	0.1	0.2
Attenuation at 490 nm			0.4	0.2	0.7
Detached Coccolith Concentration			0.1	0.2	0.4
Phycoerythrin Concentrations				0.2	0.2
Dissolved Organic Matter			0.4	0.2	0.7
Suspended Solids			0.4	0.2	0.7
Glint Field			0.4	0.2	0.7
IPAR			0.1	0.1	0.2
Ocean Cal Data Sets					0
Primary Production (Oceans)			0.4	0.2	0.7
Land-Leaving Radiances			14.4	2.8	17.3
Topographically Corrected Radiance			14.4	2.8	17.3
Vegetation Index			3.8	1.7	5.5
Polarized Vegetation Index			3.8	1.7	5.5
Land Surface Temperature			0.5	0.2	0.6
Thermal Anomalies			0.5		0.5
Evapotranspiration				0.1	0.1
Primary Production (Land)				0.1	0.1
Snow Cover			0.2	0.0	0.2
Spacial Heterogeneity (not sized here)					0
Land Cover Type				0.0	0.0
Bidirectional Reflectance, BRDF				0.0	0.0
Cloud Mask			1.6		1.6
Cloud Fraction				0.0	0.0
Cloud Effective Emissivity			0.1	0.0	0.1
Cloud-Top Temperature and Pressure			0.3	0.0	0.3
Cloud Optical Thickness (0.66 μm)			0.1	0.0	0.1
Cloud Particle Effective Radius			0.1	0.0	0.1
Cloud Particle Thermodynamic Phase			0.0	0.0	0.0
Aerosol Optical Depth (0.41 to 2.13μm)				0.0	0.0
Aerosol Size Distribution				0.0	0.0
Aerosol Mass Loading				0.0	0.0
Atmospheric Stability			0.1	0.0	0.1
Total Precipitable Water			1.7	0.0	1.7
Total Ozone			0.1	0.0	0.1
Browse		5.2	2.7	1.0	8.8
Metadata (Not sized here)					0
Ocean Discipline Subtotal (L-2/3)			12.1	9.5	21.6
Land Discipline Subtotal (L-2/3)			37.6	9.5	47.1
Atmosphere Discipline Subtotal (L-2/3)			4.0	0.0	4.0
Total	72.0	121.6	56.4	20.0	270.0

MODIS Data Processing Requirements (Lines of Code)

PROCESSING LEVEL	LAUNCH LOC	GROWTH LOC
Level-1A	25,000	25,000
Level-1B	25,000	30,000
Calibration/Monitor	72,000	144,000
Level-2 Ocean	8,000	16,000
Level-2 Land	40,000	80,000
Level-2 Atmosphere	20,000	40,000
Level-2 Shell	30,000	30,000
Level-2 Utility	40,000	80,000
Level-2 IDS Products	36,000	72,000
Level-3	40,000	80,000
Near-Real-Time	18,000	82,000
Subtotal	354,000	679,000
Supporting Software (validation)		552,000
Total		1,231,000

MODIS Data Processing Requirements (in MFLOPS)

PROCESSING LEVEL	MFLOPS
Level-1A	26
Level-1B	33
Level-2 Ocean	15
Level-2 Land	8
Level-2 Atmosphere	51
Level-3	45
Reprocess*2	356
Near-Real-Time	18
Browse	4
Metadata	2
Maintenance	18
Cntl/Shell	18
Reserve	175
Total (Launch)	763

Year-by-Year Data Volume Estimates for MODIS-N

(GigaBytes)

Initial launch of first series (three consecutive 5-year missions) on June 30, 1998
Initial launch of second series on March 31, 2000

Year

Level	1996	1997	1998	1999	2000	2001	. . .	2012	2013	2014	2015	Total
0	69	480	12528	25056	43848	50112	. . .	50112	37584	25056	6264	725559
1A	72	504	13149	26298	46022	52596	. . .	52596	39447	26298	6575	789516
1B	122	851	22207	44414	77725	88829	. . .	88829	66622	44414	11103	1333408
2	56	395	10300	20600	36050	41200	. . .	41200	30900	20600	5150	618451
3 and above	20	140	3553	7305	12784	14610	. . .	14610	10958	7305	1826	219310
Total	339	2370	61837	123673	216429	247347	. . .	247347	185511	123673	30918	3712914

Notes: Daily volumes per MODIS-N instrument are:

Level-0:	68.6 gigabytes	Level-2:	56.4 gigabytes
Level-1A:	72.0 "	Level-3:	20.0 "
Level-1B:	121.6 "	and above	

Entries are computed as follows:

1996	1 day of data	2001 through 2012	24 months of data each year
1997	1 week of data	2013	18 months of data
1998	6 months of data	2014	15 months od data
1999	12 months of data	2015	3 months of data
2000	21 months of data		

DRAFT

MODIS Science Data Support Team (SDST)

FY 1992 Work Plan

Other MODIS SDST Plans being developed:

MODIS SDST Project Plan

MODIS Software and Data Management Plan

MODIS Team Leader Computing Facility Plan

DRAFT

Table of Contents

1 Introduction

The objective of this work plan is to document the support to be provided by the MODIS Science Data Support Team (SDST) for FY 1992. The SDST provides support for the development of the MODIS science data processing system. The specific tasks for FY 1992 include the following:

(a) Generate a schedule for the development, validation, integration, operational testing, documentation, maintenance, modification, and configuration management of the MODIS science data processing algorithms. Circulate the schedule to the Team Members, and have it ready for a topic of discussion at the next MODIS Science Team Meeting.

(b) Identify requirements and define goals for Computer Aided Software Engineering (CASE) tools. Develop a plan for acquiring and testing tools to be used in the MODIS environment.

(c) Figure out what is needed from the Team Members with the algorithms they will provide. Define the software guidelines to be satisfied by Team Members algorithms such that the SDST can bring the algorithms to effective operational status in the EOSDIS environment.

(d) Develop a schedule for development of the MODIS algorithms for which the SDST is responsible (including Level-1A and Level-1B).

(e) Provide Level-1 science data processing for the MODIS Airborne Simulator (MAS).

(f) Identify the "first-purchase" Team Leader Computing Facility hardware and initiate the procurement. Develop a strategy for the evolution of the TLCF.

(g) Develop a Project Management System for the MODIS SDST, including schedules and milestone charts, documentation control plans, action item and tracking lists, significant assumptions, staffing, cost, earned value, etc.

(h) Develop a training plan to prepare SDST members for specialized tasks (CASE Tools, object oriented languages such as C++, etc.).

(i) Develop the following documents:

MODIS SDST Project Plan,

MODIS Software and Data Management Plan,

MODIS Team Leader Computing Facility (TLCF) Plan.

(j) Identify the resources required to carry out the work of the SDST, and develop a schedule of SDST activities for FY 1992.

Additional information on these tasks is provided in the following sections.

2 MODIS Software Development Schedule

The MODIS Science Team Members will develop their own algorithms for generating special products in addition to some of the core products. The SDST will provide support for porting and integrating the MODIS Science Team Members algorithms into the EOSDIS system. The SDST will also conduct operational testing, review documentation, and assure that Team Members algorithms meet the software standards set by the EOS Project.

The SDST will generate a schedule for the development, delivery, validation, integration, operational testing, documentation, maintenance, modification, and configuration management of the MODIS science data processing algorithms. The schedule will be circulated to the Team Members, and it will be ready as a topic of discussion at the next MODIS Science Team Meeting.

The elements of the Software Development Task are:

2.1 Draft List of Algorithms

2.2 Identify Software Development Steps

2.3 Estimate Time for Each Step

2.4 Identify Staffing Implications of Schedule

2.5 Complete Schedule

2.6 Identify Prototype Algorithms

2.7 SDST Prototype Action

3 Computer Aided Software Engineering (CASE) Tools

The MODIS SDST will identify requirements and define goals for Computer Aided Software Engineering (CASE) tools. The SDST will develop a plan for acquiring and testing tools to be used in the MODIS environment.

The elements of the CASE Tools Task are:

3.1 Define CASE Tools Goals

3.2 Identify CASE Tools Candidates

3.3 CASE Tools Purchase

3.4 Develop CASE Tools Test Plan

4 Software Guidelines for Team Members Algorithms

The MODIS SDST will develop software guidelines to be satisfied by Team Members algorithms, so that the SDST can bring the algorithms to effective operational status in the EOSDIS environment. The MODIS SDST will provide support as necessary for compliance with the EOSDIS recommended coding and documentation standards for software to be tested, operated, and maintained in the PGS production environment.

The software is to be designed, coded, tested, and validated by the Team Members following the guidelines provided by the SDST (with support from the SDST as necessary). The software is then delivered to the SDST for porting, integration, testing, and validation on the TLCF, and for assurance that the software complies with the EOSDIS coding and documentation standards. The SDST then delivers the software to the EOSDIS for integration into the PGS production environment.

The elements of the Software Guidelines Task are:

4.1 EOSDIS Software Standards

4.2 Programming Language Guidelines

4.3 Data Format Guidelines

4.4 Software Documentation Guidelines

5 Schedule for SDST Algorithms

The MODIS SDST will generate a schedule for development of the MODIS algorithms for which the SDST is responsible. MODIS Level-1A and Level-1B algorithms, and some of the higher level algorithms will be developed, tested, validated and integrated on the TLCF by the SDST. Many of the utility algorithms will be handled in the same way.

The MODIS Level-1A product has been defined in terms of its contents and reversibility. It has also been decided that the sensor data will not be unpacked. The scan cube has been identified as a meaningful unit of data for some purposes, but the scan cube is too small as a unit for ordering and distributing the data. A suitable data structure for distribution will be determined. A schedule will be generated for the Level-1A algorithm development.

For the MODIS Level-1B product, the data will be calibrated and Earth-located. The scan cube is still a meaningful unit of data, but a larger unit is needed for distribution. With calibrated radiances, and with no further reversibility requirement, there is more flexibility in defining the format and structure. An examination of this issue will be coordinated with the science team members to assure that their requirements are met. The Level-1B design must be refined to provide for ground location information based upon image registration and the use of a digital elevation model (DEM). A schedule will also be generated for the Level-1A algorithm development.

The elements of the SDST Algorithm Schedule Task are:

5.1 Identify Steps in MODIS Level-1A Algorithm

5.2 Schedule Time for Each Level-1A Step

5.3 Identify Steps in MODIS Level-1B Algorithm

5.4 Schedule Time for Each Level-1B Step

5.5 Complete SDST Algorithm Schedule

5.6 Develop Algorithms (this year)

6 MODIS Airborne Simulator (MAS) Data Processing

Level-1 science data processing support will be provided for MODIS Airborne Simulator (MAS) experiments. Processing code (currently at Version 1.x stage) will be upgraded to Version 2.x. The code will also be modified and updated on a continuing basis as required or requested after feedback from the Science Team, M. King and P. Menzel. Imaging capabilities incorporating NetCDF on: VAS, IRIS, PC's, MAC, etc. will be implemented as part of the tools/utilities suite.

For each flight, the MAS Level-1 data product in NetCDF format will be delivered within five working days from receipt of the complete data set (Level-0 sensor data plus INS data). A "User's Guide" describing the data and indicating how it is to be read will be provided along with the data.

For field experiments, it is valuable to have someone in the field, (or in close contact with those in the field) to check data quality, assist in correcting instrument problems or failures, calibration, etc. This is especially important in early test stages. Support may also be required in flight planning; e.g. weather conditions at the site. If ground or in-situ data are taken in conjunction with MAS overflights, we may act as a central distributor.

Registration of MAS imagery may require investigation. Integration of MAS processing into the Version 0 Distributed Active Archive Center (DAAC) must also be investigated. Imaging capabilities incorporating NetCDF on: VAX, IRIS, PC's, MAC, etc. will be implemented as part of the tools/utilities suite.

The elements of the MAS Task are:

6.1 MAS Software Maintenance

6.2 MAS Level-1 Processing

The earliest MODIS-N processing system prototype performs Level-1 processing on MAS data. Dual data streams of instrument telemetry and Inertial Navigation System (INS) data are merged, navigation and calibration are performed, and NetCDF formatted output is produced. This version of the MAS processing system is presently operational.

6.3 MAS Field Support

6.4 MAS Data Users Guide

6.5 MAS Data Catalog

6.6 Extended MAS Level-1 Processing

The next version of the MAS processing system allows the generation of metadata for each data granule, as well as reduced resolution summaries for the identification of cloud coverage, snow cover, etc. The addition of browse and metadata utilities extend the capability of the prototype. This functionality is expected in March/April 1992.

6.7 MAS Level-1 Processing (50 channel)

Version 2.0 of the MAS processing system accommodates the planned 50 channel capability of the MAS. This functionality is expected to be in place by June 1992.

7 MODIS "First-Purchase" TLCF

The MODIS SDST will identify the "first-purchase" Team Leader Computing Facility hardware and initiate the procurement. For the first purchase, a UNIX work station will be selected and installed in the TLCF, supporting CASE tools, Fortran, C and C++ (or some other object oriented language). The system will be used for MAS processing and development of utilities and Level-1 algorithms.

A strategy will be developed for the evolution of the TLCF. The TLCF computing capacity (CPU power, storage capacity, communications, displays, I/O, etc.) must grow in response to the increasing requirements resulting from scheduled growth and phasing of algorithm development, rehosting, integration, testing, validation, modification and evolution. Increasing capacity will also be needed to support instrument

characterization and calibration. The design of the TLCF must be responsive to the planned life-cycle evolution of requirements, operating environment, and expected work load.

The elements of the TLCF Task are:

7.1 Identify First TLCF Hardware

7.2 Procurement Plan for First TLCF

7.3 Evolution Strategy for TLCF

8 MODIS SDST Project Management System

The MODIS SDST will develop a Project Management System, including schedules and milestone charts, documentation control plans, action item and tracking lists, significant assumptions, staffing, cost, schedules, earned value, etc.

The elements of the SDST Project Management Task are:

8.1 Project Management, Schedules

8.2 Project Management, Staffing

8.3 Project Management, Earned Value

8.4 Project Management, Documentation Control

8.5 Project Management, Action Items

8.6 Project Management, Significant Assumptions

8.7 Project Management, Tracking List

9 MODIS SDST Training Plan

The MODIS SDST will develop a training plan to prepare its members for tasks requiring the use of CASE Tools, the UNIX operating system, object oriented languages (such as C++), and system management of the TLCF workstation, .

The elements of the SDST Training Plan Task are:

9.1 SDST Training Plan, CASE Tools

9.2 SDST Training Plan, UNIX Operating System

9.3 SDST Training, Object Oriented Language

9.4 SDST Training, TLCF System Management

10 MODIS SDST Deliverable Documents

The MODIS SDST will develop the following documents:

MODIS SDST Project Plan,

MODIS Software and Data Management Plan,

MODIS Team Leader Computing Facility (TLCF) Plan.

10.1 MODIS SDST Project Plan

The MODIS Science Data Support Team Project Plan will document the support to be provided by the MODIS (SDST) to the MODIS Science Team Leader and Team Members within the context of the EOS objectives, the MODIS objectives, and within the EOSDIS structure. The Project Plan will address the objectives, related activities, technical plan, management, end item schedules, resources, reviews, and quality assurance as they relate to the MODIS SDST activities.

A strawman was delivered in October, 1991. The draft version will be delivered in March 1992, and the final version will be delivered in July 1992. Revisions will be delivered as required.

10.2 MODIS Software and Data Management Plan

The MODIS Software and Data Management Plan will describe the manner in which the MODIS instrument data will be acquired, calibrated, validated, Earth located, processed, archived and distributed to the science users, within the EOSDIS data management structure. The end-to-end data flow from its origin at the MODIS instrument to the science product archival and distribution will be described in the EOSDIS context.

The Plan will further define the nature of the algorithms to be

produced and the computer resources and software tools required for algorithm development, data processing, and generation of special products. A configuration management system will be provided for the protection and assurance of operational software and data products.

The collection and management of input data, ancillary data and data from external sources will be described as they relate to the processing and production of MODIS products. The manner in which reference data for ground control points, digital elevation and terrain models, atmospheric models, coastline definitions, etc. will be collected and integrated into the system will be specified.

The Plan will describe the output products to be produced, including standard, quicklook, browse, and special products. The descriptions will include the volume, product level, and format of the output data. The use of Investigator Working Group (IWG) approved standard formats will be emphasized.

The software development and validation schedule will be consistent with the EOS Science Software Development Schedule. It will be based upon the three initial software versions required prior to launch:

V1 launch minus 33 months: Test migration from TLCF to the EOSDIS, exercise interfaces, and test execution in operational environment.

V2 launch minus 21 months: Correct any problems in V1, complete operator interface, generate all messages.

V3 launch minus 9 months: Software ready for launch. Final integration, test of operations procedures, training of operations staff.

Each delivery will include software, test data, user's guide, operations guide, and software version description.

Consideration will be given to the processing and management of quick look data for field experiments, targets of opportunity and special investigations. A plan will be provided for the generation and delivery of metadata and browse products.

The responsibilities of the MODIS Science Data Support Team will be identified in terms of data product requirements, operational scenarios, algorithm integration and testing, design and

implementation of the operational processing system, data product validation, integration of computer resources, and development of documentation during the definition, prelaunch and postlaunch phases.

A "strawman" version of the plan will be delivered in January 1992. The draft version will be delivered in June 1992. A revision will be delivered in June 1993, and the final version will be delivered in June 1994. Software review materials will be delivered annually.

10.3 MODIS Team Leader Computing Facility Plan

The MODIS Team Leader Computing Facility (TLCF) Plan will identify and document the functional, operational and performance requirements, operations concepts, and science scenarios for the TLCF.

The MODIS TLCF must support pre- and post-launch algorithm development, integration, testing, validation, modification and evolution. It must also provide computing resources for the MODIS Team Leader and Goddard Team Members, and it will provide support for quality control and test of the MODIS products. Special products for the Team Leader and some of the Goddard team members, will be generated on the TLCF. These requirements will be addressed in the TLCF Plan.

The TLCF computing capacity (CPU power, storage capacity, communications, displays, I/O, etc.) must grow in response to the increasing requirements resulting from scheduled growth and phasing of algorithm development, rehosting, integration, testing, and validation. Increasing capacity will also be needed to support instrument characterization and calibration. The design of the TLCF must be responsive to the planned life-cycle evolution of requirements, operating environment, and expected work load. The TLCF Plan will be based upon these life-cycle requirements.

The plan will include costs and schedules for the purchase of equipment and software, facilities and services to be provided by others, and the networking requirements.

A "strawman" version of the plan will be delivered in January 1992. The draft version will be delivered in June 1992. The final version will be delivered in June 1994. Revisions will be delivered as needed.

11 MODIS SDST Schedule and Resources

The schedule of SDST activities for FY 1992, and the resources required to carry out the work of the SDST are shown in the attached charts and tables (in preparation).

The elements of the SDST Schedule and Resources Task are:

11.1 MODIS SDST Schedule

11.2 MODIS SDST Resources